Digital Cytopathology in the Heart of Europe: A Bioptická Laboratoř Experience

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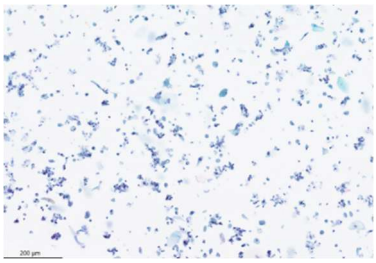
Introduction

Bioptická Laboratoř, located in Pilsen, Czech Republic, is one of the largest pathology laboratories in Central and Eastern Europe. Processing over 200,000 histology cases and more than one million cytology cases annually, the laboratory faced the dual challenge of a declining number of pathologists and a rising case volume. To maintain its position at the cutting edge of diagnostics, the lab integrated AI-powered tools specifically designed for urine cytology.

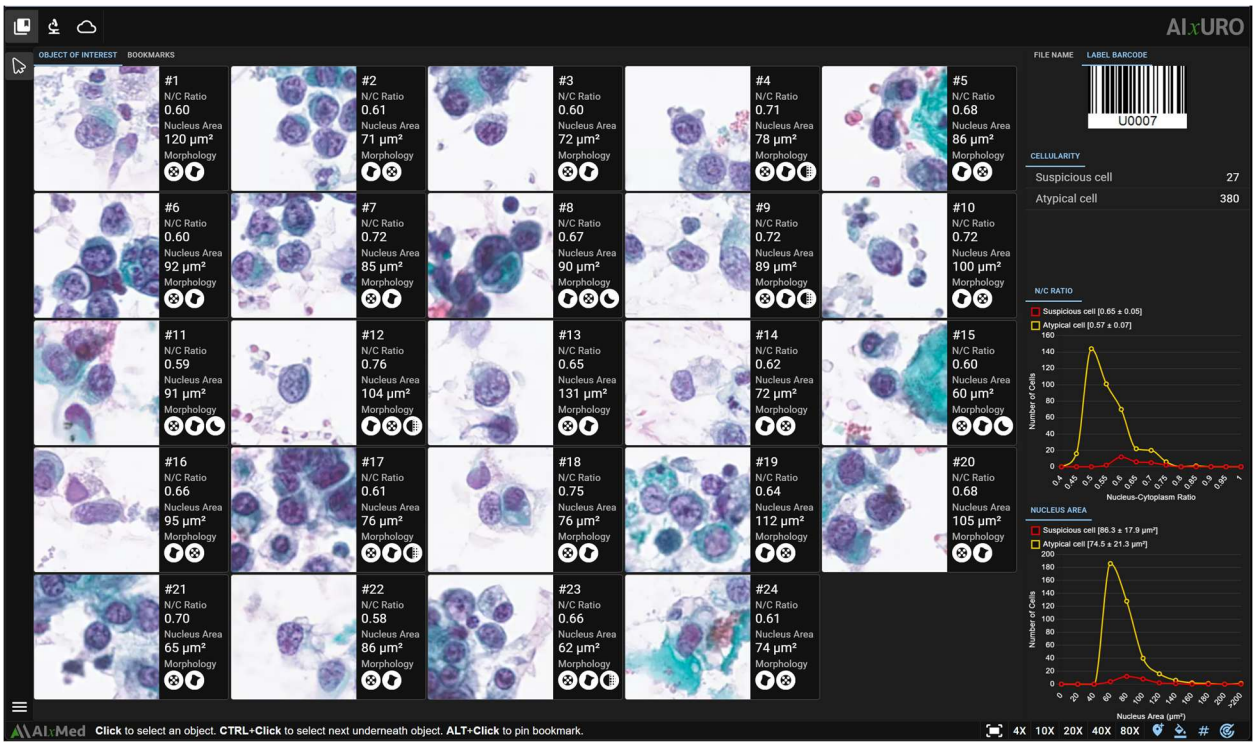
The Challenges of Manual Cytopathology



The traditional manual cytology review process is inherently time-consuming and cognitively demanding. Pathologists must scan an entire slide, identify atypical or suspicious cells, and maintain a mental count and morphological profile of these cells. Even a benign case requires several minutes of focused effort.

The AIxURO Solution To overcome the limitations of manual review, Bioptická Laboratoř implemented AIxURO, a robust, Research Use Only, analytical software tool designed specifically for analyzing digitized urine slides. The AIxMed Cytology Viewer provides pathologists with a comprehensive and highly intuitive interface engineered for clinical practice. Key features of the software include:

- **Comprehensive Cell Counting:** Automated quantification of both suspicious and atypical cells across the entire slide.
- **Curated Gallery View:** An organized visual gallery of the most abnormal cells, categorized according to the Paris System 2.0.
- **Detailed Cellular Metrics:** Precise calculation of the Nucleus-to-Cytoplasm (N/C) ratio, nuclear area size, and morphological characteristics for each identified abnormal cell.
- **Enhanced Detection Capabilities:** The advanced ability to detect and flag positive cells that may be obscured or hiding behind inflammation.
- **Optimized User Experience:** A streamlined interface that presents all critical data and features directly before the user without overlapping elements, while remaining easy to combine with physical glass slides for traditional reviews.



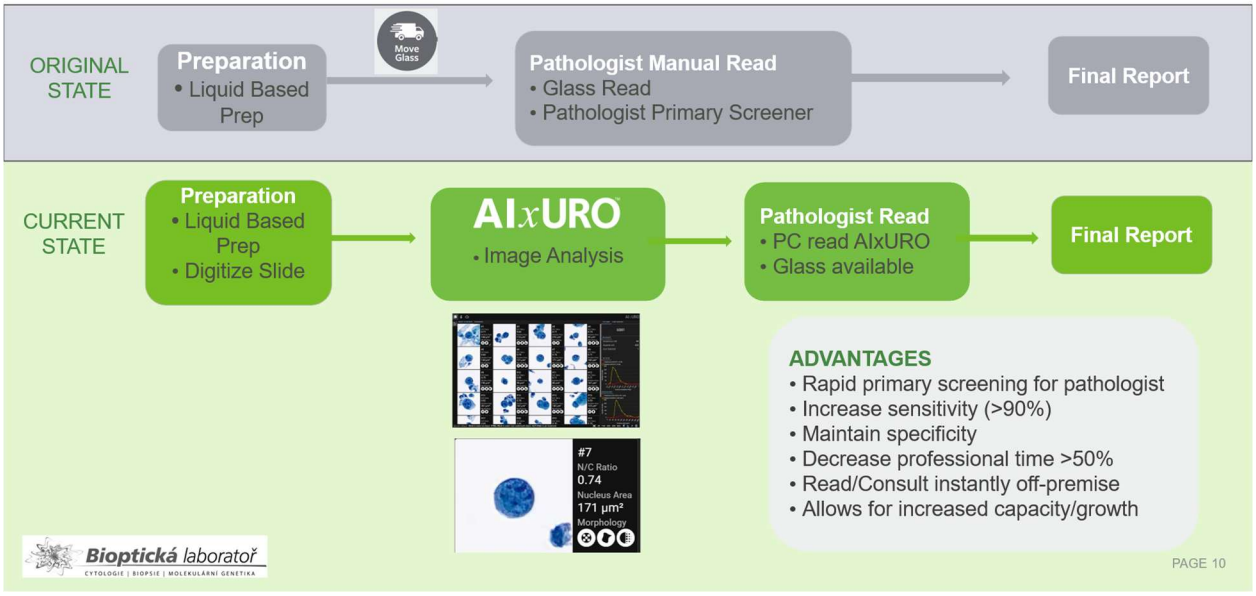
Implementation and Validation

Bioptická Laboratoř adopted AIxURO, a robust analytical software tool, following a multi-phase validation process:

- **Initial Pilot:** A 10-slide demo to test the system's feasibility and ease of use.
- **Phase 1:** A targeted validation of 50 slides, focusing on atypical cases to assess diagnostic decision-making.
- **Phase 2:** A final validation of 110 slides (50% positive, 50% negative) to establish sensitivity and specificity.
- **Full Roll-out:** Full integration was completed by January 2026.

Modernized Workflow

1. **Digitalization:** Slides are scanned and securely uploaded to the AIxCloud.
2. **AI Screening:** AIxURO analyzes the digital slides, automatically flagging and quantifying atypical and suspicious cells.
3. **Pathologist Review:** Pathologists use a standalone viewer alongside their homegrown Laboratory Information System (LIS) to evaluate the AI-curated images.
4. **Reporting:** Final diagnoses are issued in a matter of seconds based on the consolidated data.



Clinical Outcomes and Benefits

The implementation of the AI-driven workflow resulted in significant improvements:

- **Increased Speed:** Pathologists reported a 30% to 50% increase in workflow speed, with the diagnosis of benign cases often reduced to mere seconds.
- **Enhanced Sensitivity:** The AI was slightly biased toward sensitivity, ensuring that atypical cells were prioritized for review.
- **Objective Data:** The system provides quantitative metrics for atypical and suspicious cells, removing subjectivity from the diagnostic process.
- **Improved Efficiency:** The reduction in screening time allowed the lab to free up capacity for growth without compromising accuracy.

Conclusion

Clinical use of AIxURO resulted in a 30–50% faster overall read time, improved sensitivity with more objective data for atypical cases, and a noticeably better user experience. The system is easy to use, avoids unnecessary features, integrates well with glass slides, and supports increased efficiency and growth in routine clinical practice.

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